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MONTHLY REPORT - MAY 1981

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Editor, Southwest Fisheries Center
P. O. Box 271
La Jolla, California 92038

IZADORE BARRETT, Center Director
JOHN F. CARR, Deputy Director
LILLIAN VLYMEN, Editor

SOUTHWEST FISHERIES CENTER

LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - MAY 1981

STATUS OF PUBLICATIONS

Published

Mendelssohn, Roy. 1980. Using Box-Jenkins models to forecast fishery dynamics: identification, estimation, and checking. Fishery Bulletin, U.S. 78(4): 887-896.

Box-Jenkins models are suggested as appropriate models for forecasting fishery dynamics. Unlike standard production models, these models are empirical, dynamic, stochastic models. Box-Jenkins models are not biased when estimating relationships between catch and effort, as are standard production models. The use of these techniques is illustrated on catch and effort data for the skipjack tuna fleet in Hawaii. An actual 12-month forecast is shown to give a reasonable fit to the observed data. Most of the discrepancies are explained by changes in the behavior of the fishermen (i.e., economic factors), rather than by lack of knowledge of the behavior of fish.

Owen, R. W. 1980. Patterning of flow and organisms in the larval anchovy environment. Intergovernmental Oceanographic Commission Workshop Rep. No. 28: 167-200.

A considerable body of evidence exists to suggest that patchiness of plankton frequently and widely arises from patterned ocean circulation. Environmental circumstances under which such patterns arise are more common than generally thought, and thus may be more widespread than isolated case studies indicate. Prediction of patterning and de-patterning circulations may be possible and would be of inestimable value in forecasting yield of fish stocks as affected by the patterning of their food supply. Determination of patterning of organisms should also enhance the

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accuracy of biological production models constructed for populations at any position in the food web. In this paper, patterning of plankton populations and communities by their interaction with physical processes are discussed, with special reference to eastern Pacific boundary regions and their capacity to support early stages of engraulid fish populations. Patterning mechanisms and efforts are documented by case studies appropriate to a large range of scales, and some old hypotheses are restated. Coastal upwelling and its biological effects are treated only in a general way.

Theilacker, Gail, and Kathleen Dorsey. 1980. Larval fish diversity, a summary of laboratory and field research. Intergovernmental Oceanographic Commission Workshop Rep. No. 28: 105-1442.

Good and poor year-classes of fish may be determined during the larval stage by the direct or indirect effects which physical events have upon their food supply. Larval survival depends not only upon environmental variables and prey availability at first feeding, but also upon a host of species-specific behavioral and physiological characteristics. Minimum food concentrations needed to initiate feeding and promote larval fish survival will vary among species due to differences in egg size (and hence, development at hatching), resistance to starvation, feeding strategies, growth rates, growth efficiencies, and metabolic demands. Therefore, food concentrations and other input parameters in models designed to predict recruitment and survival must incorporate species-specific functions. In this paper, pertinent life history and behavioral and physiological parameters of four important pelagic representatives of related species of the California and Peru Currents are presented, along with 12 predominantly demersal species of the north Atlantic Ocean.

Approved by Center Director

Eber, L. E. Large scale sea surface temperature anomalies in the Pacific Ocean. For consideration for publication in CalCOFI Reports.

Eldridge, M. B., P. Benville, and J. A. Whipple. Physiologic responses of striped bass (Morone saxatilis) embryos and larvae to low, sub-lethal concentrations of the aromatic hydrocarbon benzene. For consideration for publication in the Proceedings of Gulf and Caribbean Fisheries Institute.

Evans, R. H. On the apparent displacement of the temperature and salinity axes of the Columbia River plume. For consideration for publication in the Journal of Marine Research.

Ralston, Stephen, and Garret T. Miyamoto. Estimation of the age of a tropical reef fish using the density of daily growth increments. For consideration for publication in the Fourth International Coral Reef Symposium, Manila, Philippines, 18-22 May 1981.

Squire, James L., Jr. Catch temperatures for some important marine species off California. For consideration for publication in NOAA Technical Reports.

Administrative Reports

Honolulu Laboratory

Shomura, Richard S. (Chairman). Summary report of the Pacific Ciguatera Workshop, Honolulu, Hawaii, 18-20 March 1981.

La Jolla Laboratory

Beltestad, A. K. 1981. Purse seines with hexagonal mesh. SWFC Admin. Rep. LJ-81-12.

Delmer, T. N., and T. C. Stephens. 1981. Development of a numerical simulation of purse seine fishing. SWFC Admin. Rep. LJ-81-13.

Translation

Makihara, Makoto. 1980. Toward effective utilization of the abundant shark resources (Hōfu no same shigen wo yūkō riyō suru). From Suisan Shohu (The Fishing and Food Industry Weekly) No. 898, p. 22-26. (Engl. transl. by Tamio Otsu, 1981, 9 p., Transl. No. 52; available Southwest Fisheries Center, NMFS, NOAA, Honolulu, HI 96812.)

HONOLULU LABORATORY

INSULAR RESOURCES INVESTIGATION

CROMWELL Departs on Cruise to the Northwestern Hawaiian Islands

Richard N. Uchida, Task Leader of the Insular Ecosystem Study, reported that the NOAA research ship, Townsend Cromwell, departed Snug Harbor on May 11 to begin cruise TC-81-03 (Part I). According to Chief Scientist Bert S. Kikkawa, the cruise will survey and assess various physical, chemical, and biological parameters quantitatively which are pertinent to energy flow, productivity, and mineral cycling near Kawaihae on the island of Hawaii and at French Frigate Shoals in the Northwestern Hawaiian Islands (NWHI). The cruise is another in a series of cooperative cruises involving the University of Hawaii (UH) Sea Grant Program under the Tripartite Agreement to survey and assess the biological resources of the NWHI. On the cruise with Kikkawa are scientists from the UH and the U.S. Fish and Wildlife Service.

Studies on Spiny Lobster Sexual Maturity and Fecundity Continue

Research Assistant James L. Prescott reports that he has been attempting to adapt a computer program, MATURE, for use in the UH Computing Center's system to analyze spiny lobster maturity data. He has been successful for the most part; however, one error remains to be corrected in the subroutine that fits a logistic curve to the cumulative percentage of mature lobsters over a range of size categories. The error may be minor because the program's results seem very realistic. For example, the estimated size at 50% maturity for male and female Panulirus marginatus caught off Oahu, was 53 and 46 mm carapace length (CL), respectively. This seems to be a reasonable estimate, considering the number of berried females caught during March which were less than 50 mm CL. The larger size at first maturity among males is consistent with the results obtained for the western Australian rock lobster, P. versicolor, by Australian researchers.

Research Assistant Victor A. Honda continued studies on lobster fecundity. He met with Dr. Craig MacDonald of the University of Hawaii Zoology Department to discuss the results of his lobster fecundity studies; MacDonald is conducting spiny lobster life history studies at Kure Atoll and at French Frigate Shoals. Honda reported that his results compared favorably with those obtained by MacDonald; differences in the estimated fecundity were relatively small.

Bottomfish and Spiny Lobster Data Analyzed

Dr. Jeffrey J. Polovina, Statistician, assisted by Programmer Edward Webman, has been using multivariate techniques to examine the relative

abundance of spiny lobsters and bottomfish with respect to individual islands and banks in the NWHI. Using data collected on Cromwell cruise TC-81-02, Dr. Polovina and Research Assistant Darryl T. Tagami also completed a discriminant analysis on the relationship between carapace length and frozen tail width of spiny lobsters based on 115 fresh and frozen width measurements. The preliminary results indicated that freezing did not affect tail width significantly; therefore, the analysis was expanded to incude 1,651 fresh tail width measurements. Because freezing of specimens on the Cromwell does not reflect the actual processing done on commercial vessels, Polovina said that this study will be pursued further using data collected by NMFS observers placed on domestic vessels that fish for lobsters in the NWHI.

Manuscript on Length-Weight Relationships In Preparation

Fishery Biologist James H. Uchiyama and Biological Technician Darryl Tagami have begun preparation of a manuscript on the length-weight relationships of several species in the snapper-grouper complex caught in the NWHI, including the kahala (Seriola dumerili), pig ulua (Caranx cheilio), opakapaka (Pristipomoides filamentosus), kalikali (P. sieboldii), gindai (P. zonatus), ehu (Etelis marshi), onaga (E. carbunculus), and hapuupuu (Epinephelus quernus). The data for each species were examined for possible differences due to sex, time of year (by cruise), and area of capture. No significant differences were found between sexes and among areas. For individual cruises, however, there were significant differences among slopes of the length-weight relationships for opakapaka, hapuupuu, and pig ulua. The differences among cruises, according to Uchiyama and Tagami, appear to be related to time of year. Data for these three species will be re-examined after measurements from more cruises are included in the analysis.

Food Habit Studies Continue

This month Research Assistant Michael P. Seki began studies on food and feeding habits of pig ulua and hapuupuu. Preliminary analysis of 36 stomachs and spew samples collected from pig ulua on cruises of the Cromwell from 1978 through April 1981 showed fish in 75% of the samples; fish families most frequently encountered in the samples included Bothidae, Congridae, and Tetraodontidae. Seki found crustaceans in 52.8% of the stomachs; these included shrimps, (11%), crabs (30%), and stomatopods (19%).

Research Assistants Steven H. Kramer and Robert L. Humphreys, Jr., continued their studies on the food and feeding habits of kahala taken by handline in the Northwestern Hawaiian Islands.

Charter Cruise to Western Pacific Completed

Research Assistant Robert B. Moffitt completed the cruise report for the charter cruise of the F/V Typhoon which ended in April and has begun preparation of the narrative report. According to Moffitt, the cruise produced important information on the depth distribution of caridean shrimps

around Saipan, Tinian, and Esmeralda Bank. He also reported that one unidentified Laparididae was taken in a shrimp trap at 1,097 m (600 fathoms). Night-light fishing, bottom fishing, kona crab netting, and trolling, however, produced very poor results during the cruise.

* * * * * * * * * *

Task Leader Richard Uchida continued work this month on several sections of the Guam/Northern Mariana Islands background document, which he is writing in collaboration with Dr. L. G. Eldredge of the University of Guam Marine Laboratory. He also completed the final cruise instructions for TC-81-04, and presided over the post- and pre-cruise meetings for TC-81-02 and TC-81-03, respectively. At the request of Dr. T. Dinell of the University of Hawaii's Urban and Regional Planning Program, Uchida also reviewed drafts of an Issue Paper (Fisheries Management, Technical Findings and Recommendations) and a Fisheries Development Supplement prepared by the Hawaii Coastal Zone Management Program of the Department of Planning and Economic Development.

* * * * * * * * * *

Research Assistant Bernard M. Ito reported that he received instructions from Dr. Lucille Kimura of the Cancer Center of Hawaii in the use of the enzyme-linked immunoaborbent assay (ELISA) kit for testing fish tissues for ciguatoxin under field conditions. He was also involved in discussions with the Honolulu Laboratory's Automatic Data Processing personnel in developing a logbook format for recording catch, effort, and other information on fishing operations for spiny lobsters in NWHI.

FISHERY MANAGEMENT PROGRAM

Structure of the Hawaii Fresh Fish Market Under Study

Dr. Michael F. Adams, Industry Economist, assisted by Research Assistant James C. Cooper, continued investigations into the structure of the Hawaii fresh fish market. Preliminary results indicate that as many as two-thirds of the fishermen making sales each year are turnovers, involved either as new entrants or exiting the fishing business. Almost half of the wholesalers purchasing fish are also turnovers. This information suggests that some market structure conditions exist which are not conducive to the exercise of market power in the industry. Previous studies have concluded that prices are not competitively determined at the ex-vessel and wholesale levels due to the exercise of market power.

Hawaii Skipjack Tuna Landings Continue Below Long-Term Average

The May 1981 Hawaii landings of skipjack tuna were estimated at 189 metric tons (MT), which is 132 MT above the May 1989 landings and 232 MT below

the 1964-80 long-term average for May. The cumulative landings from January through May were estimated at 451 MT, which is 258 MT above the 1980 landings for the same period and 450 MT below the 1964-80 long-term average for the same period.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

Satellite Remote Sensing Applications in Fisheries Research

Satellite Images of Infrared Ocean Temperatures Processed for Greater Accuracy

This month members of the Albacore Fisheries Program worked to improve the accuracy of satellite infrared ocean temperature imagery in preparation for research on satellite data which were collected and archived during recent CalCOFI cruises. In order to apply mathematical statistics properly on these images, it is essential that images of the same geographical areas be aligned. To do this, the satellite images need to be processed to correct for three types of distortion: time, temperature, and geographic registration.

Fixed buoys are located along the track of the satellite; these read back to the satellite the time at which it passes over. This time is compared to the predicted time of coverage, producing a time-adjustment factor which can be implemented in the reformatting program. The accuracy of the ocean temperature measurements may be improved by calibrating the infrared of the satellite sensor to its internal black body temperature. By calibrating these data, reflectivity at any given wavelength can be eliminated; the resultant thermal records are primarily emitted rather than reflected infrared measurements. In order to correct for geographic distortion, a 25-point square grid can be overlaid on an image and the line and sample grid on the image "stretched" to match the longitude and latitude grid of the overlay. A further time adjustment function is being created at the Scripps Remote Sensing Facility (SRSF) to take into consideration the slight movement of the "permanent" buoys. After this factor has been corrected, it is predicted the images will be accurate to within one pixel (the smallest unit of measurement on these images).

As part of this project, Ron Lynn, Oceanographer, and Randee Recht, Remote Sensing Specialist, examined images of differences between successive infrared (IR) NOAA-6 satellite images of the Southern California Bight. Prior to this examination, Recht had calibrated the imagery to satellite black body temperatures and spatially registered land points and calculated orbit time corrections. The images were also converted to a common equal-area mapping. Thermal IR differences between images from orbit intervals of 12, 24, and 36 hours were formed from December 1980 satellite passes taken during a CalCOFI cruise. During this sequence, strong thermal fronts and eddies prevailed in the Bight and were recorded by data taken aboard the NOAA research vessel, David Starr Jordan.

The different images examined by Lynn and Recht revealed that even over a 12-hour period, enough changes in the thermal patterns occur to provide detailed outlines of a multiplicity of thermal features throughout the image. These short time interval differences were chosen to reveal the nature and magnitude of problems which might be a part of such an analysis. Differences over longer time intervals are produced not only by advection of thermal features but by heat exchange and mixing.

This first attempt to improve the accuracy of the satellite images indicated that: 1) additional data processing is needed to remove atmospheric effects upon the calibration, 2) a "mapping"" routine is needed to set common gray-scale values, 3) conversion to pseudo-color under a "mapping" might provide an improvement, and 4) routines to average data over various spatial scales are needed.

The best in the series of NOAA-6 images received during the January albacore exploratory longlining survey were reprocessed in order to provide a multiple photo montage. The highest resolution was used and the same gray-scale assignments were used in each image. This avoided the checkerboard pattern common to earlier montages. Positions of the three chartered fishing vessels throughout their transit were plotted on the cloud-free portions of the images in preparation for writing a report on the satellite-support of this survey.

Satellite Images Processed for Fisheries Demonstration Project

This month Randee Recht, Remote Sensing Specialist at the La Jolla Laboratory, archived and reformatted NIMBUS-7 satellite passes as part of a real-time Fisheries Demonstration Project begun this month and sponsored by the NASA-Jet Propulsion Laboratory. Scientists at the La Jolla Laboratory are participating in the project, which is designed to produce information to aid fishermen in locating favorable waters. Other organizations contributing to the project include the Visibility Laboratory-Scripps Institution of Oceanography, Scripps Remote Sensing Facility, and Ocean Data Systems Incorporated (ODSI).

Manuscript on North Pacific Transition Zone Ocean Frontal Structure Submitted for Publication

Ron Lynn, Oceanographer, completed a rewrite of his "fronts" manuscript based on four outside reviews and submitted it to the Journal of Physical Oceanography. The manuscript, entitled "The subarctic and subtropic fronts in the eastern North Pacific in spring," gives a descriptive analysis of these features and demonstrates their year-to-year variability.

LARVAL FISHES, COASTAL E. PACIFIC PROGRAM

Fecundity Section of Manual on Egg Production Method of Biomass Assessment in Progress

This month Dr. John Hunter, Leader of the Larval Fishes, Coastal E. Pacific Program, began preparation of a section on fecundity estimation for a handbook on the larval production method of biomass assessment of anchovy. Dr. Nancy Lo, Statistician, and Roger Leong, Fishery Biologist, are also working with Hunter on this project. Lo completed statistical analyses to determine the number subsample of the ovaries required to reduce the variance of the fecundity estimate to acceptable limits and whether sample location in the ovary affected the estimate. No effect of sample location was detected nor was it necessary to use both sides of the ovary; hydrated eggs appear to be typically distributed homogenously throughout the ovary. It was also discovered that important reduction in the variance of the regression of batch fecundity (total hydrated eggs) on female weight occurs when more than three ovary subsamples are taken.

The effect of formaldehyde preservation on anchovy weight was another variable examined in the fecundity chapter. In the egg production method, fecundity is expressed on the basis of female weight and all females used for the analysis have been preserved in formaldehyde. Hunter reports that, on the average, females gain about 4% in wet weight after formaldehyde preservation. This gain usually occurs after the first 24 hours of preservation and remains more or less constant thereafter (maximum time: 85d). Fish which are not preserved alive, or are alive and pithed, do not take up the preservative as rapidly but reach the 4% value after 85 days in preservation.

Analysis in this section indicates that operator reliability is high in the fecundity analysis despite the fact that different personnel have done the work over the last 3 years. Cross checks of fecundity estimates among different personnel indicate that essentially the same mean fecundity was obtained for each fish analyzed.

These and other details of the methodology are outlined in the fecundity section of the handbook, including a brief review of fecundity estimation, preservation and effects of preservatives, curation, procedures for estimating fecundity, accuracy and precision of the estimate, underlying assumptions, and a discussion of the fecundity-female weight relationship.

Hunter Plans June Trip to Peru

On June 19 Fishery Biologist Dr. John Hunter will travel to Peru, where he will deliver a series of lectures over 3 weeks at the Instituto del Mar del Peru (IMARPE) and consult with various Peruvian and German scientists engaged in applying the egg production method of biomass assessment to the Peruvian anchoveta population. Hunter will lecture on the following topics: Feeding ecology of larval fishes, predation on larval fishes, reproduction in the

clupeoids, methods of fecundity estimation, energetics of clupeoids, methods of fecundity estimation, energetics of clupeoid fishes, reproduction energetics of anchovy, schooling behavior, and other topics.

Two Students Complete Doctoral Work

Richard Methot and Kim Devonald, graduate students who are associated with the Southwest Fisheries Center, passed their doctoral examinations this month at Scripps Institution of Oceanography. Staff of the Southwest Fisheries Center were members of the doctoral committee of both students. Methot defended a thesis concerned with seasonal growth patterns of anchovy larvae, which included an analysis of seasonal changes in the birthdate distribution of anchovy. Devonald presented a thesis on the feeding ecology of jack mackerel larvae with an emphasis on diagnosing starvation, determination of incidence of feeding, and selectivity of feeding in the sea. Both studies represent advances in marine ecology and make significant contributions to ongoing research programs in the Coastal Division.

MULTISPECIES TAXONOMY PROGRAM

Progress on Manuscripts on Rearing of Hypsoblennius and Calico Rockfish

Dr. Geoff Moser, Fishery Biologist, and Betsy Stevens, Biological Laboratory Technician, this month worked on their manuscript describing the reproductive biology and early development of the blenny genus Hypsoblennius. In addition, a manuscript co-authored by Moser and John Butler, Fishery Biologist, describing the rearing of the calico rockfish, Sebastes dallei, went through final review and was accepted for publication in CalCOFI Reports.

* * * * * * * * * *

Computer entry of the data from vertical stratification cruise 8003 EB was initiated by Rich Charter, Computer Specialist, and Carol Miller, Computer Clerk, in collaboration with Dr. Geoff Moser.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION PROGRAM

Ageing Classification of Anchovy Eggs Described

Dr. Paul Smith, Fishery Biologist, and Roger Hewitt, NOAA Corps, have prepared documents for the procedural handbook for the egg production method of estimating the spawning biomass of a multiple spawning pelagic schooling

fish, the northern anchovy. Program participation has included 1) the design, testing, and construction of the new net; 2) the analysis of the conversion of staged egg data to daily egg production; and 3) the design of the cruise pattern to maximize sampling efficiency by spacing the sampling pattern in time and space to achieve high precision with minimum redundancy of sampling. The procedural handbook is to be assembled and edited by Dr. Gary Stauffer, Fishery Biologist with the SWFC's Commercial and Recreational Fisheries Research for Management Task. Egg staging analysis has been completed with the help of Dr. Geoffrey Moser, Fishery Biologist with the MARMAP I, Multispecies Taxonomy Task, and Jeff Napp of Scripps Institution of Oceanography.

It now appears possible to assign unbiased ages to the staged eggs automatically and it is proposed to accomplish this by comparison with the conference processing used in 1979 and 1980 and tandem analysis for the 1981 egg production estimate. The procedure is outlined in Figures 1 and 2 for two temperatures. The higher temperature (16.5°C) can be calibrated with existing laboratory rearing data (Figure 1) and the lower temperature (Figure 2) can be calculated from known hatching times. The egg mortality rate and initial egg production can then be assembled directly from sample data which provide the number at each stage, a representative temperature, and the time of day for each sample.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

1981 Anchovy Biomass Surveys Nearing Completion

Jim Thrailkill, Fishery Biologist, reports that the New Horizon and David Starr Jordan are in the midst of their scheduled CalCOFI 8105 cruises and are on schedule. These cruises are the last in the series for anchovy biomass surveys. The plankton samples for 8104 cruises are now sorted and the editing of larva data for 8101 and 8102 cruises is complete. Richard Charter, Computer Specialist, is in the process of converting the data extraction program to the VAX system. This is the last in a series of programs used in the CalCOFI data management system for the larva census method of biomass estimation. According to Dr. Gary Stauffer, Fishery Biologist, the biomass estimation project for the July deadline is on schedule.

Processing of the female anchovy collections for the egg production estimate is also about on schedule. Biological Aid Scott Miller, working for Dr. John Hunter, completed the initial processing of the February Nelle Belle anchovy samples on schedule. A review of the sorting and staging rates for the CalVET egg samples from the 8102 and 8104 Jordan cruises indicated that task should be completed by the end of September just after the last female gonad is processed. The data analysis for final egg production estimate of the 1981 anchovy spawning biomass, needed to complete the calibration study of the 1981 estimates, should be finished by November.

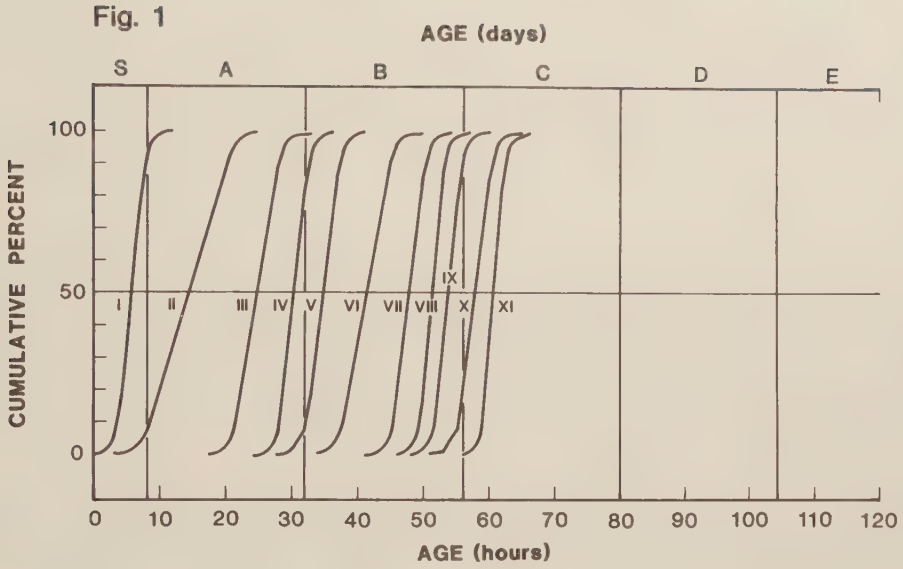

Figure 1. A model of the successive appearance of anchovy egg stages following spawning. Relative stage durations at 16.5°C, appearance of eggs at time of spawning, and hatching of eggs after stage XI are shown.

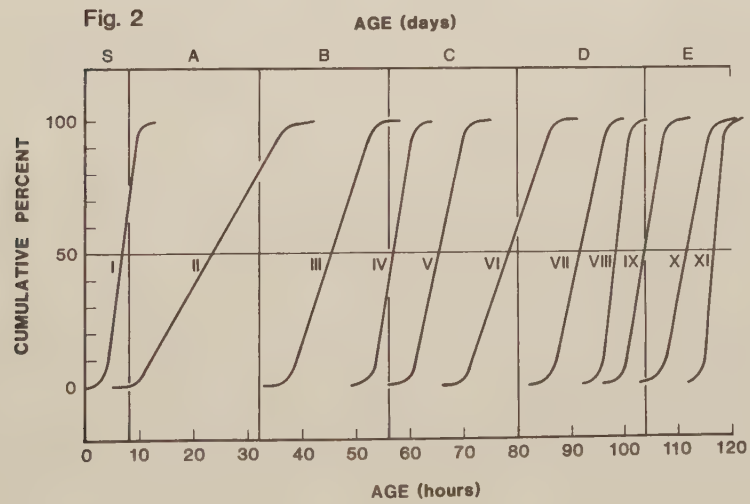

Figure 2. Sample model of the central northern anchovy subpopulation at 11.5°C. (Note: The standing crop of eggs is twice that at 16.5°C, given the same number of eggs at spawning.)

Parameter Bias in Trawl-Caught Anchovies Examined

This month Susan Picquelle, Statistician, reviewed and began documentation of her study of the relationship between the bias in sampling spawning females and the time of night when trawling occurs. She began by reviewing all data files and compiling a notebook of the data and tables and summary statistics created by the computer package, MINITAB.

During this process Picquelle found problem areas which need more work. She has already shown that the occurrence of spawning females in the trawl sample varies with the time of night and the time of year the trawl is taken. To make sure these two effects were not being confounded, she checked the distribution of trawls over the hours of the night and over 2-week periods spanning February through April. A x^2 test of independence showed that the sample was balanced with respect to these two factors.

Picquelle also used the x^2 test to pinpoint the hours of the night that sampling bias occurs. She used MINITAB to form a contingency table where the classifying variables were time of night (1800-0600 broken into one hour categories) and spawning (day-0 female, day-1 female, and mature non-spawning female). The cells in the table having high x^2 scores is one indication of the hours when bias is occurring in trawling. These hour groups are 2100-2300 and 0300-0500. After excluding these hours from the data, a repeat of the contingency table analysis showed no significant relationship between the occurence of day-0 and day-1 females.

A similar analysis was performed to test the hypothesis that the frequency of day-0 females equals the frequency of day-1 females in the sample, and that this frequency does not vary with time. Again, this hypothesis was rejected until the hours 2100-2300 and 0300-0500 were omitted. This is an important result because the frequencies of both day-0 and day-1 females are independent estimates of spawning fraction, but significant differences have occurred between these estimates in all previous work.

Picquelle performed the same sequence of analyses to test the hypotheses that sex ratio based on numbers rather than weight of females is independent of the sampling time, that the sex ratio is 1:1 and that this ratio does not vary significantly with time of day. The first hypothesis was rejected until the hours 2100-2300 and 0300-0500 were excluded, implying that the same sampling bias is affecting both spawning fraction and sex ratio estimation. The second hypothesis was still rejected after omitting these time periods, leading to the conclusion that sex ratio is significantly different from 1:1 even after correcting for the bias during the above time periods.

Analysis of Recreational Fishing Values Continues

Jane McMillan, Economist, continued to work with Dr. Daniel Huppert, Industry Economist, on the analysis of data on recreational partyboat fishing in California. Values of recreational fishing can potentially be estimated using data on travel cost and time to the fishing site. As a preliminary test of this "travel cost model," McMillan examined a subset of data collected

during the California partyboat survey contract. Specifically, she examined the data for the San Francisco area salmon fishing trips during the summer of 1979. Several models were tested, including one model which included all individual data, and another which averaged data by zip code groups for the San Francisco area. A logit model with weighted adjustments was also tested. Numerous regression equations were estimated by McMillan using the SPSS (statistical package for the social sciences) package.

Manuscript on Anchovy Spawning Geography Planned

Alec MacCall, California Fish & Game Marine Biologist stationed at the La Jolla Laboratory, spent much of May reviewing the ecological literature in preparation for writing a manuscript on anchovy spawning geography. The concept of the geographic spawning model, often called "the theory of habitat selection," has arisen at least twice in ecology; however, both cases referred to bird populations. This theory has not progressed very far in field ecology studies, due to the obscure nature of density dependence and the lack of a long time-series covering a wide range of population sizes. These factors are considered to be less of a problem in analyzing fish populations.

AMRMS Data Base Update Continues

Susan Iacometti, Computer Specialist, reports that work started this month on the verifying and updating processes for the Aerial Marine Resources Monitoring Systems (AMRMS) data base. Data from the latter half of 1979 have been keypunched and deposited on disk on the BURROUGHS. Progress has also been made on the transfer of the data base to the VAX. DATATRIEVE, the database management system on the VAX, will be the primary tool used for extracting and compiling information and reports. Iacometti and Computer Specialist Rich Charter worked on the DATATRIEVE conventions and procedures in preparation for implementation.

Oceanic Fisheries Resources Division

TUNA/BILLFISH RESOURCES PROGRAM

Tuna/Billfish Resources Program Scientists Attend 32nd Annual Tuna Conference

The 32nd Annual Tuna Conference was held at Lake Arrowhead, California, May 17-20, 1981. Two scientists from the Tuna/Billfish Program of the SWFC, Fishery Biologists Dr. Norman Bartoo and Hillary Herring-Dyal, acted as Session Conveners. Three other scientists fom the La Jolla Laboratory presented papers at the Conference: Dr. Gary Sakagawa, Chief of the Oceanic Fisheries Resources Division, La Jolla Laboratory, spoke on ICCAT's

International Skipjack Year Program; Dr. Ronald Rinaldo, Fishery Biologist, discussed western Atlantic skipjack tuna; and Dr. Samuel Herrick talked about Atlantic yellowtail tuna management alternatives. Other Program scientists attending the Conference included Al Coan, Mathematician, Robert Nydam, Computer Programmer, Tony Majors, Fishery Biologist, and Earl Weber, Fishery Biologist. Dr. Herrick was selected to chair the 33rd Tuna Conference to be held next year.

Sakagawa presented a summary of the 4-year research program on Atlantic skipjack tuna. The program is an ICCAT-coordinated research program with specific activities designed to answer four basic questions: (1) Can catches be increased by fishing new areas? (2) Can catches be increased by fishing larger size groups of the population? (3) What would be the effects of increased catches from new areas and larger size groups on current fisheries? and (4) How can better assessments on the condition of the stocks be made with information from current fisheries? As a party to the ICCAT Convention, the United States and 18 other countries are involved in the research.

In his paper, Rinaldo reviewed available fishery and biological data on western Atlantic skipjack tuna in order to formulate working hypotheses on stock structure that might aid in the International Skipjack Year Program research. The literature was reviewed and research cruise data were examined for pertinent information on skipjack tuna in the western Atlantic, Caribbean, and Gulf of Mexico. Length-frequency and spatial-temporal distribution of catches were analyzed and the results evaluated. Available data were found to be sparse. Stock structure evidence for a single Atlantic-wide or east-west stocks was presented.

Skipjack distributions in the Atlantic seem to follow generally the same pattern as observed in the Pacific, with the exception of the Gulf of Mexico and Caribbean basins. Supporting data indicate that larval concentrations appear in the northwest between 0° and 20°N latitude, although spawning occurs year-round throughout the equatorial Atlantic as in the Pacific. Juvenile and young skipjack tuna appear to be more widely distributed in cooler waters and in higher latitudes than skipjack larvae. Young adult skipjack are first found in the Caribbean in warm surface water and in the Atlantic in the cooler surface water. Longline data indicated that adult skipjack occur in the higher latitudes in the second semester of the year. Data from the Cuban baitboat fishery indicated adult skipjack occur in the Caribbean Sea-Gulf of Mexico basin year-round.

Herrick presented some intial results of an ongoing investigation of alternative management schemes designed to protect juvenile tuna in the Atlantic Ocean. Sample Atlantic yellowfin, bigeye, and skipjack tuna catch data and yellowfin length-frequency data from the Atlantic surface fishery (baitboat and purse seine) were used to estimate the small yellowfin (55 cm fork length), total yellowfin, bigeye, and skipjack catches from selected time/area/gear strata in the eastern tropical Atlantic. These strata were then evaluated in terms of the small yellowfin protected versus the total yellowfin, bigeye, and skipjack catch foregone in order to identify candidate strata under a time/area/gear(s) closure management scheme. Preliminary results indicate relatively high purse seine and baitboat catches of small

yellowfin from the Gulf of Guinea off the coasts of Ghana and the Ivory Coast during the early part of the year. However, unless the surface catches of large yellowfin, bigeye, and skipjack foregone during a closure of this area to the surface fishery later become available in adjoining areas or the same area, the losses from such a closure are likely to outweigh the benefits.

Skipjack Tuna Sampling Manuals Compiled

As part of a continuing involvement of Southwest Fisheries Center scientists in the development of an intensified Atlantic-wide skipjack tuna research program, Dr. Ron Rinaldo, Fishery Biologist, and Al Coan, Jr., Mathematician, have worked with Dr. Philip E. K. Symons, Skipjack Coordinator of the International Commission for the Conservation of Atlantic Tunas (ICCAT), to write and compile a Shipboard Sampler's Manual and a Port Sampler's Manual. (Please see photograph on the following page.) The manuals are designed to standardize collection of skipjack data for the ICCAT-sponsored research program called the International Skipjack Year. ICCAT receives skipjack data from 19 member countries, including the United States, and several non-member countries. In order to establish an effective data base which all interested countries may use, it is vital that the input of data be uniform; the two Sampler's manuals have been written precisely with this goal in mind. The manuals are already considered to be pacesetters in fishery sampling procedures, and will be standard references for years to come.

French Fishery Scientist Visits SWFC

Dr. R. H. Pianet, Fishery Biologist with the Centre Oceanologique de Bretagne, Brest, France, visited the La Jolla Laboratory during the week of May 25, 1981, to consult with scientists of the Tuna/Billfish Resources Program on matters concerning tuna fisheries research in the Atlantic Ocean. (Please see photograph on the following page.) Cooperative arrangements between French and U.S. scientists workin on the Commission for the Conservation of Atlantic Tunas (ICCAT), International Skipjack Year Program (ISYP) research were discussed during Pianet's visit. According to Pianet, French fishery scientists are particularly interested in techniques that scientists at the SWFC have developed in the areas of acoustic tagging and tracking of tuna, satellite applications to fisheries research, and measuring otolith growth rings for ageing of fish.

1980 Pacific Cooperative Marine Game Fish Tagging Program Successful

Since 1954, billfish have been tagged by marine game fishermen who cooperated in tagging programs in many of the major sportfishing areas of the Pacific. The marine game fish tagging program is currently supported by the National Marine Fisheries Service in cooperation with the International Game Fish Association. James Squire, Fishery Biologist at the La Jolla Laboratory who coordinates the tagging program, reports that 1,725 fish were reported

Al Coan, Jr., and Dr. Ron Rinaldo, at work on the Shipboard Sampler's Manual and Port Sampler's Manual for skipjack tuna.

Dr. R. H. Pianet, French Fishery Biologist, confers with members of the SWFC Tuna/Billfish Resources Program. Left to right: Dr. Ron Rinaldo, Pianet, Al Coan, Jr., and Dr. Sam Herrick.

tagged and released in 1980. This is a 57% increase in number of fish tagged over the 1979 record of 989 fish. Billfish accounted for 1,438 or 83% of the fish tagged in 1980.

1980 was a record year for the tagging of striped marlin (Tetrapturus audax): This fish accounted for 1202 (84%) of the 1,438 tags reported received at the Southwest Fisheries Center. Other tagged billfish included sailfish (Istiophorus platypterus), 157 tagged, (11%); blue marlin (Makaira nigricans), 21 tagged (1%); black marlin (Makaira indica), 54 tagged (4%); shortbilled spearfish (Tetrapturus augustirostris), 2 tagged (1%); swordfish (Xiphias gladius), 1 tagged (< 1%); and one marlin, unidentified. Of the fish tagged in past years, a total of 24 were reported recovered in 1980, an increase of 7 recoveries over the number reported in 1979.

Increased tagging of billfish (striped marlin, swordfish) and species of oceanic shark (thresher, mako and blue shark) is being encouraged in U.S. waters off southern California, in cooperation with the National Coalition of Marine Conservation, the State of California Department of Fish and Game, and the National Marine Fisheries Service. The tagging program for billfish (blue, striped, sailfish, and shortbilled spearfish) in the central Pacific is being coordinated by the Pacific Gamefish Foundation, Honolulu, Hawaii, which is headed by Dr. Richard Brill, Scientific Director.

1980 Pacific International Billfish Angler Survey Underway

The Pacific International Billfish Angler Survey is conducted annually throughout the Pacific area in cooperation with the International Game Fish Association, and with the assistance of the Pacific Gamefish Foundation and marine angling clubs. Information collected through this annual survey, which began in 1969, is made available to any interested organization. The 1980 angler survey is now in progress.

The 1979 billfish angler survey data show 12,343 angler days reported, a decrease from 14,681 in 1978. The number of billfish reported captured in 1978 was 3,796, down slightly (8%) from 4,142 fish in 1978. The overall billfish catch rate (fish per angler day) for 1979 was 0.31 or 3.25 days fishing per fish. This is slightly (11%) more than that observed in 1978 (0.28 fish per day, 3.54 days fishing per fish), but continues to be well below the 1969-1972 average of 0.55 fish per day, or 1.80 days per fish.

The 1979 survey catch totals by species for the 12,343 angler days reported are: Striped marlin, 1,948; sailfish (including shortbilled spearfish), 956; blue marlin, 487; and black marlin, 405.

Inspection of the total Pacific catch for marlin (striped, blue, and black), sailfish, and shortbilled spearfish, 1960-1976, shows that most species are now being caught in fewer numbers than observed prior to 1970. Catches of blue and striped marlin are down substantially. Blue marlin catches appear to have reached a "high" in the early 1960's and striped marlin in the mid to late 1960's. There continues to be a high commercial demand for the marlins, swordfish and sailfish.

Detailed information on CPUE rates for striped marlin, blue and black marlin, and sailfish is given in the 1981 Billfish Newsletter recently issued by the Southwest Fisheries Center.

Results of Columbia River Plume Study Reported

Richard H. Evans, Oceanographer with the Tuna/Billfish Program, has submitted a manuscript for publication, "On the apparent displacement of the temperature and salinity axis in the Columbia River Plume." The report is based on hydrographic data collected between 1961 and 1969 for the summer months off Oregon. The data indicate that the salinity axis of the Columbia River plume is displaced inshore from the temperature axis, at a mean distance of 8.5 nautical miles. This pattern appears consistent among years and is statisticlly significant at the 1% confidence level. A simple empirical model demonstrates this displacement to be the result of the mixing of colder upwelled water across the nearshore plume pycnocline. The magnitude of the displacement of the temperature and salinity axis in the plume is hypothesized to be negatively correlated with the intensity of coastal upwelling. This hypothesis was tested with the results being significant at the 1% level.

Manuscript on Bigeye and Yellowfin Tuna Gonad Study Completed

Hillary Herring-Dyal, Fishery Biologist, and Dr. Stephen Goldberg, Professor of Biology, Whittier College, have submitted a manuscript entitled, "Histological gonad analyses of late summer-early winter collections of bigeye tuna (Thunnus obesus) and yellowfin tuna (Thunnus albacares) from the northwest Atlantic and the Gulf of Mexico," for the NOAA Technical Memorandum series. Results of their research indicate no spawning activity during August through February for yellowfin tuna and September through February for bigeye tuna sampled from the populations under study. Furthermore, the lack of follicular atresia in females during February through September indicated that they had not been spawning during the previous 6-8 weeks. Additionally, there was no increase in oocyte size which is typical 8-10 weeks prior to the onset of spawning, thus advancing the postulated onset of spawning to April through May at the earliest.

MARINE MAMMAL BIOLOGY AND TECHNOLOGY PROGRAM

SWFC Scientists Present Papers at Alternative Fishing Methods Workshop

On May 27-28, Fishery Biologists James M. Coe and Dr. Al C. Myrick, Wildlife Biologist Dr. Warren E. Stuntz, and Operations Research Analyst Dr. David Au presented papers at the "Workshop on Possible Alternatives to the Practice of 'Setting-On' Porpoise to Catch Yellowfin Tuna," a meeting sponsored by the U.S. Marine Mammal Commission. Nearly 40 persons

participated in the meeting at Hubbs-Sea World Research Institute in San Diego, California.

The paper which was presented by Coe and authored by Coe, Dave Holts and Dick Butler, (both Fisheries Methods and Equipment Specialists at the La Jolla Laboratory), is a survey of NMFS dolphin mortality reduction research from 1969 to the present. It includes a description of the nature and complexity of the problem and recounts details of research in the areas of net and vessel handling, dolphin rescue, behavioral research, design, and technology transfer methods. Results of a decade's work are summarized and recommendations for further research are included. A complete bibliography of reports and papers generated by the project is also included.

Myrick's paper, "A proposed method for dolphin fishing on yellowfin tuna without capturing dolphins," outlines adaptive biological components for tuna and associated dolphins and postulates an experimental method for attracting tuna away from dolphins using a suite of token and primary stimuli. The net is set around the tuna school, which by then (theoretically) is free of the dolphin herd.

Stuntz's paper described several hypotheses focusing on the reasons for the association between yellowfin tuna and dolphins.

Au and Dr. P. Dustan (Visibility Laboratory, UCSD) have completed a draft of a California current cetacea and mesoscale oceanography manuscript. They presented part of their findings in an exhibition satellite oceanography as applied to cetacean studies at the workshop.

Several new approaches to the problem of harvesting yellowfin tuna without setting nets around dolphins were suggested and discussed by the working group. New methods for prediction, detection and aggregation of yellowfin tuna were given considerable attention. A report of the workshop results is being prepared by Dr. P. Major, Marine Mammal Commission.

Plans Made for Final Testing of Satellite-Linked Marine Mammal Transmitter

Jacqueline G. Jennings, Fishery Biologist, reports that arrangements and testing are underway for the final field experiment of the satellite-linked transmitters to take place off Kona, Hawaii, in June. As a result of SWFC analyses of dolphin surfacing patterns, transmitters have been modified. The delay between signals has been reduced from 14 to 7 seconds to increase the probability of signal reception during longer surfacings. Although this modification will reduce the life of the transmitter, it should allow for enough transmissions for the satellite computer to fix positions through Doppler calculations.

To insure that they would function properly in the field, Jennings and Ray Stives, Biological Technician, tested the two transmitters from the roof of the La Jolla Laboratory on May 12 and 13. The maximum number of transmissions were received by Goddard Space Flight Center from both units on

the May 12 satellite pass, but on May 13 the Hawaiian tracking station reported malfunctions in one of the transmitters.

Stives and Tod Foster, Gear Technician, simulated dolphins in the water off Scripps Institution of Oceanography to test the transmitters during another satellite pass. The maximum number of up-links (correctly received messages from transmitter to satellite) were received by Goddard from both units. After a checkout of both units on the mechanical dolphin simulator, a final roof-top test between SWFC and the Hawaiian tracking station was conducted on May 19. Fourteen signals were received from one transmitter, but no up-links were received from the problem unit during the short time that La Jolla and Hawaii were in view of the satellite. The unit was shipped to HANDAR to complete the tests.

Through the cooperation of HANDAR and NASA the necessary testing equipment has been secured from the Drug Enforcement Agency on an interagency loan for use in the Hawaii experiment. Hank Fallek, Vice President of HANDAR, has agreed to provide electronics expertise for the up-coming Hawaii field experiment.

High Incidence of Sea Lion Strandings Noted in May

John Henderson, Fishery Biologist, reports that in May the Marine Mammal Salvage Project locally retrieved carcasses of 19 California sea lions, Zalophus californianus, the highest monthly total since the Project's inception a year ago. The increase is due primarily to an influx into the local population of yearling pups, which have recently weaned and are thought to be more susceptible than adults to parasitism and disease. Fourteen of the 19 carcasses represented yearlings.

An increased number of sea lions in the southern California area may have resulted in increased mortality from human activity. Henderson noted that four of the carcasses which were recovered showed gunshot wounds.

Age Determination on Spotted Dolphin Subsample Progresses

Dr. Al Myrick, Task Leader of the Marine Mammal Age Determination Project, reports that approximately three-fourths of the randomly-selected 1600-tooth sample of male and female spotted dolphins has been prepared by decalcification and staining. Myrick and Aleta A. Hohn, Zoologist, are carrying out independent readings on the sample. Each decalcified and stained preparation is being read three times and compared with two readings made of its untreated, thin-sectioned couunterpart. A final reading will be made of both preparations of each specimen examined together. Hohn and Myrick's readings will then be compared. Problem specimens, for which the readings indicate substantial differences of interpretation, will be re-examined jointly for possible consensus.

DeMaster Participates in Mexican Research Program on California Sea Lions

Dr. Douglas DeMaster, Wildlife Biologist at the La Jolla Laboratory, and Dr. Bruce Mate, Oregon State University, spent 2 weeks this month working with other scientists from the Center for Biological Investigations, La Paz, Mexico. Ten days spent at Isla Islotas studying California sea lions included the testing of an electric immobilization device and the use of colored sheep dyes to mark animals. Results of the work indicate that electric immobilization of sea lions will require significantly more power than ordinarily used to immobilize other animals and that sheep dyes work well for marking sea lions, even if animals enter the water immediately after application of the dyes.

Stuntz Attends Conference on the Ethology and Behavioral Ecology of Fishes

During the week of May 19, Dr. Warren Stuntz, Fishery Biologist, attended a conference on the ethology and behavioral ecology of fishes, held in Normal, Illinois. At the conference many papers were presented on predator-prey interactions, ranging from the effects of predators on the zooplankton community to the development of visual acuity of fishes and the behavioral responses of forage fishes to predators. Stuntz reports that research results presented at the meeting will be of importance in furthering the understanding of predator/prey dynamics and very likely are adaptable to investigations and eventual management of multi-species fisheries.

USFWS Technician Visits La Jolla Laboratory to Learn Manatee Ageing Techniques

Bob Bonde, Biological Technician for the U.S. Fish and Wildlife Service, recently arrived from Gainesville, Florida, for 2 weeks' training in the newly developed preparation technique for enhancing layers in hard parts. Bonde will work with Dr. Al Myrick, Leader of the Marine Mammal Age Determination Project, on approximately a dozen manatee ear bones which will be cut, polished, decalcified, and stained in order that the technique may be used in Gainesville to determine ages of manatee. The technique was developed last winter by Dr. Myrick and Jeffrey Kelly, a student intern from Southhampton College, New York.

MARINE MAMMAL MONITORING AND ASSESSMENT PROGRAM

SWFC Scientist in Soviet Union Under Auspices of US-USSR Scientist Exchange Program

Dr. Tim Smith, Fishery Biologist and Task Leader of the Marine Mammal Population Assessment Project at the SWFC, is presently participating in a

joint US-USSR exchange of scientists. Smith is visiting the Soviet laboratory at Batumi on the Black Sea where he will participate in a 2-week ship survey of dolphins. The Black Sea dolphin fishery is the only one in the world, other than that in the eastern Tropical Pacific (ETP), which has been extensively studied. His main purpose is to learn more about techniques used by Soviet scientists in assessing the condition of the Black Sea stock.

Fourth EPOCS Cruise Underway

On May 19, Biological Technicians Robert Pitman and James Cotton left Seattle, Washington, aboard the NOAA research vessel, Oceanographer, in order to take part in the fourth Equatorial Pacific Ocean Climate Study (EPOCS). Pitman and Cotton will study cetaceans along the 110°W meridian between 10°N and 5°S latitude; a transect along the equator is also planned. Results from the last two EPOCS trips have been compared and cetacean densitiies along the 110°W meridian were found to be twice those found in the summer. Stratificiation of the tropical waters into distinct faunal-interaction regions was again demonstrated.

Hawaiian Monk Seal Photographic Study Planned

This month LCDR Wayne Perryman traveled to Hawaii to provide technical assistance in the planning and execution of an aerial photographic survey of Hawaiian monk seals, Monachus schauinlandi, in the Leeward Islands. Large format camera systems used in the study were provided by the SWFC. The films will be analyzed in La Jolla and the adult and pup counts will be compared with simultaneous ground counts. If successful, this technique would provide a more cost-effective technique for monitoring the seal populations of the remote islands.

Data Access on and Conversion to the VAX System Explored

This month Computer Specialist Ken Wallace continued to explore the problem of data access on the VAX computer, including an investigation of the possibility of automatic formatting of data for FORTRAN programs. He completed a rough draft describing a data system for the VAX, encompassing all porpoise historical data bases, and made a preliminary presentation on his proposed data system to the Marine Mammal Monitoring and Assessment Program. The general evaluation of the system was quite favorable and some small parts of the system are now being implemented on the VAX by Electronic Data Systems (EDS) contractor Chuck Devlin. Bruce Wahlen, Biological Statistician, and Ken Wallace, Computer Programmer, have completed a preliminary analysis of programming needs and amount of time required to implement a porpoise mortality monitoring system on the VAX computer similar to the system in place on the INFONET system since mid-1977.

Wahlen has also completed final revisions of an administrative report describing the use of the computer procedure EVOLVE, coded by EDS contractor Susan Boyer. EVOLVE is a procedure used to stratify data files and to provide means and standard deviations of specified variables within defined strata.

Data which have been stratified by EVOLVE may later provide input to other software packages.

Porpoise/Tuna Observer Data Encoded

Computer Specialist Frank Ralston and Biological Technician Tom Gronholt have completed a procedural documentation paper which specifies the methods employed in encoding a 3-year set of porpoise/tuna observer data. These data were originally collected during 1971 to 1973 using non-coded source forms. Many of the non-coded elements in the early data formats evolved into coded, more rigidly-defined elements as the need for computerized methods emerged. By analyzing the evolutionary stream and historical compatibility of various data elements collected during 3 years, procedural guidelines and coding definitions were developed.

Upon completion of the coding of this 3-year data set, a set of programming specifications was prepared by Gronholt and Biological Technician Mike Gregory. The specifications are to be used by EDP contractor programmer Celia Jacobs in developing a set of editing programs to be used on the historical data set. Once the programs have been verified, they will be used to improve the reliability of the data.

1981 Porpoise Observer Data Processed

Computer Specialist Frank Ralston reports that seven 1981 porpoise observer cruises have been received and keypunched as of month end; 52 tuna seiner bridge-log reports have also been received and 37 of these have been coded and keypunched. These data were collected by biological technicians assigned to tuna purse seiners by the Southwest Regional office.

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Frank Ralston, Computer Specialist, and Bob Franco, Communications Specialist, are in the process of testing 1981 editing programs which have been converted to language of the UCSD VAX computer system. Methods for manipulating and storing data files are also being explored at this time.

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Procedures Revised for Rockfish Sampling Program

This month Fishery Biologist Tina Echeverria of the Rockfish Analysis Task visited California ports between Eureka and Morro Bay to revise procedures for sampling rockfish. Data on age at maturity, interstitial fat volumes, and prey items, as well as standard fishery monitoring data such as lengths, otoliths, and sex, have been gathered for the period of April 1980 through May 1981 for all species of Sebastes (rockfishes) utilized by the sport and commercial fleets in northern California. In the future the port samplers will maintain the sampling effort but will reduce collection of viscera only to stomachs that contain prey items. The data collection of interstitial fat will be terminated. This will greatly reduce the processing time of the samples. As of the beginning of May, 4,500 fish had been processed of the 8,000 received. The processing time for samples received after May 1 should be reduced from four hours each to one hour. The port samplers will continue gathering catch statistics of species and sex composition, age and length data, and life history information, including gonad condition and prey items.

Diet of Widow Rockfish Investigated

Landings of widow rockfish have increased from a very low level prior to 1978 to 61 percent of commercial rockfish landings in 1980. Because of the tremendous growth of the fishery, and as a possible subject of investigation by the Predator-Prey Task, Fishery Biologist Peter Adams has analyzed the diet of widow rockfish from data collected in port sampling and during research trawl surveys conducted by the Northwest and Alaska Fisheries Center.

Widow rockfish appear to be feeding on myctophids, sergistid shrimp, and euphausiids. Research cruises have shown that these rockfish are largely aggregated at depth during the night and disperse during the day. Since their prey are all vertical migrators, this suggests that the widow rockfish feed at depth during the day. In addition, the intra-landing variance for widow rockfish is greater than inter-landing variance during a monthly period. Both situations are the opposite to that for most commercially important species of rockfish. Apparently, when widow rockfish are feeding, either the fish or the prey are more randomly dispersed than for other rockfish species, thus accounting for the virtual absence of widow rockfish in daytime trawls.

FISHERIES DEVELOPMENT INVESTIGATION

Progress Made on Development Projects for Local Fisheries

This month Fishery Biologist Sus Kato spent a week in Los Angeles and San Pedro, California, working on various development projects for local fisheries. The chief objective of the trip was to obtain information on the current status of the sea urchin fishery. Kato learned that packaging has changed substantially, due to changes in costs both in the U.S. and in Japan. He also provided samples of frozen sanddabs to a Japanese exporter who liked the product and intends to test its acceptance in Japan. Other samples of dried sanddabs and frozen shortbelly rockfish were provided to a processor who manufactures fish "jerky" and dried smoked fish. The sanddabs were considered to be very good, but the shortbelly rockfish were judged to be too small. Kato arranged to have samples of whiting fillets shipped from the Northwest and Alaska Fisheries Center to the processor.

During the trip Kato obtained samples of jack mackerel for proximate analysis and arranged for regular shipment of samples for this purpose. He also arranged for trial processing and marketing of domestic octopus by a processor capable of producing a product identical to that now being imported from Japan. In addition, Kato arranged for trial shipment and marketing of rock crabs from central California, and obtained historical catch data from the California Department of Fish and Game at Long Beach.

Kato was also able to observe trial production of "imitation king crab legs," made from surimi and crab flavoring. The product is excellent, and almost ready for commercial production and marketing. The chief obstacle is finding a suitable food coloring which is acceptable to FDA. Discussions were held with the plant owner about the possibility of using shortbelly rockfish as raw material.

Sail-Assisted Fishing Voyage Successful

Economist Ed Ueber accompanied the fishing vessel, Tiare, on a 6-day charter fishing cruise where fishing effort was split between salmon and rockfish. It was determined that the vessel was able to conduct fishing operations under sail in weather conditions that prevented similar sized motor-powered fishing vessels from leaving port. The sails also enabled the vessel to "hover" over schools of rockfish despite unfavorable wind and current conditions.

The contract for the Tiare has been extended for 15 days to collect additional data on the cost effectiveness of sail-assisted fishing.

Mesh Liner of Euphausiid Trawl Repaired

Repairs have been completed on the damaged 1/16-inch mesh liner of the euphausiid trawl. The liner was torn during the charter cruise of the commercial trawler, Colintino Rose II, in March. Exploratory euphausiid fishing voyages are scheduled for early June off Bodega, and early in July off Monterey, California.

PHYSIOLOGICAL ECOLOGY INVESTIGATION

Experiments to Determine Pollutant Effects on Striped Bass are Underway

Dr. Jeannette A. Whipple, Investigation Chief, reports that the entire staff of the Physiological Ecology Investigation is occupied with laboratory experiments designed to determine the effects of exposure to low-level concentrations of pollutants at all life stages of the striped bass. Those pollutants which are potential problems, based on their prevalence in the tissues of adult bass, were selected for study.

Although these experiments are still in progress, some results are available. Zinc, benzene, and zinc-benzene combined shortened the incubation period of striped bass embryos. Newly-hatched bass accumulated approximately an order of magnitude greater concentration of benzene in their tissues compared to the exposure concentration. Larvae also continue to take up the benzene and concentrate it.

Juvenile striped bass are slightly less acutely susceptible to cyclohexane and alkylated cyclohexanes than to benzene. Both chemicals have been found in wild fish and acute levels had to be established before the effects due to chronic exposures were explored. The lethal concentrations of cyclohexane and its alkylated forms ranged approximately 3 to 8 ppm. As these tests continue, it appears that toxicity increases with the extent of alkylation.

Experiments to determine the interactive effects of cestode infestation and chemical stress (benzene and zinc) on juvenile bass are presently underway. Earlier field studies found heavily parasitized fish to be burdened with pollutants. The question to be answered in laboratory tests is whether toxicants predispose the fish to parasites, or whether the parasites weaken the fish so that more pollutants are taken up. To carry out these experiments, live cestode larvae are placed in the peritoneal cavities of the bass which are then exposed to pollutants. Extensive autopsies are then being done every 4 days for a 6-week test period.

SOUTHWEST REGIONAL DATA MANAGEMENT AND ADP OPERATIONS

PACES Now Established on ADP System

Fred Kellenberger, Data Systems Manager, reports that the Pacific Area Enforcement System (PACES) is now established on the ADP system. The data base for this sytem is primarily composed of six files: California Vessel Registration, California Licenses, California Permits, Enforcement Boardings, Enforcement Sightings, and Violations. The first three files consist of information passed to ADP from the California Department of Fish and Game computer at Long Beach, where the state consolidates this information. The source for the last three files is interactive entry by enforcement agents (State and Federal) in the field.

Now that PACES is resident on ADP, the scope of information for both State and Federal enforcement groups has been greatly expanded because the Enforcement and Management Information System (EMIS), a cooperative information system between the National Marine Fisheries Service and Coast Guard, also resides on ADP. An additional benefit is having some of the data entered from the field, making the data timely and reducing the need for data manipulation at the headquarters level. There are likely to be fewer mistakes because fewer people will be handling the data.

This data base will also be of use to other people in the region in analyzing fishing activity off the coast of California. The vessel registration file, for instance, contains items such as homeport, vessel length, and type of gear, which are essential in describing the commercial fishing fleet.

SWFC Data File Inventory Entered into ADP System

Dorothy Roll, Systems Analyst, reports that the SWFC data file inventory in the format specified by the NMFS Central Office in Washington, D.C. has been implemented on ADP Network's 1022 Data Management Systm. John Davies, Computer Specialist stationed at the Southwest Region, wrote the data entry and data base load programs for this file/inventory system. Entered into the system are all the file descriptions for the La Jolla Laboratory, the Tiburon Laboratory, and the Pacific Environmental Group, plus 20% of the files for the Honolulu Laboratory. These files may be cross-referenced by 5 indices: File ID number, laboratory/division, resource, subject, and data collection area. Documentation on how to query the system for reports will be drafted and distributed to users in June.

INFONET Use to Terminate in September

With the end of INFONET usage in September, the lease for the DATA 100 remote job entry (RJE) station will be terminated because the DATA 100 cannot

communicate with ADP Network Services, the NOAA-wide timesharing system. The DATA 100 will be replaced by two printer units: A line printer and a teleprinter terminal. The line printer will be linked directly to the VAX at the University of California, San Diego (UCSD). The teleprinter terminal will communicate on a dial-up switchable 300/1200 baud line modem to host computers, such as ADP Network Services DEC 10, UCSD Burroughs/VAX, and NWAFC Burroughs (Seattle).

For about 4 days in late May, the porpoise account on INFONET was suspended due to lack of funds. With DoC's approval, $20,000 was transferred from the unallocated $45,000 in the master account. The approved amount is the cost estimated by Dr. Tim Smith, Project Leader for the porpoise program, for data storage, file updates, and critical report generations for the period from June through September 30, 1981.

Four Technical Users Meetings held in May

ADP Operations hosted 4 computer technical users meetings during May at the La Jolla Laboratory. The topics discussed included container files on VAX, DCL (VAX command file) for file copy, and the use of the DIABLO, the 300 baud print-wheel teleprinter. The users meetings are a platform for training sessions, the exchange of users' experience on the Burroughs/VAX systems, and for establishing standard computer procedures.

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At the request of Leon Garoyan, Economist at the University of California, Davis, Computer Programmer Oden Burris generated reports of summarized landings by vessels, species, and ports from the Coastwide Data Base. The species analyzed were Dover sole, Rex sole, Pacific cod, Pacific Ocean perch, sablefish, and dungeness crab.

MISCELLANEOUS

HONORS AND AWARDS

Honolulu Laboratory

Wildlife Biologist William G. Gilmartin, Honolulu Laboratory Federal Executive of the Year nominee, and Townsend Cromwell Chief Boatswain Howard W. Kamauu, Federal Employee of the Year nominee, were among the Honolulu area Federal employees honored at the Federal Day Awards Luncheon at the Coral Ballroom, Hawaiian Village Hotel, on May 6.

PUBLIC AFFAIRS

Honolulu Laboratory

On May 5, Director Richard Shomura presented a talk to Dr. J. Parrish's fisheries class at the University of Hawaii, Honolulu.

Tiburon Laboratory

On May 1, Norman J. Abramson, Director of the Tiburon Laboratory, was reappointed to serve on the Educational Advisory Committee to assist in the evaluation and assessment of the Marine Environmental Technology Program, Marin Community College District, for the coming year.

Patrick Rutten, NOAA Corps, attended the Fishermen's Festival at Santa Barbara, California, on May 9. He manned a NOAA-NMFS exhibit booth which included octopus prepared for eating, fishing gear, and photographs of Japanese octopus fisheries. Tiburon Laboratory's display was considered "one of the best" at the Festival.

SEMINARS

La Jolla Laboratory

May 4 - Sharon Lundin, NASO Personnel Office, spoke on "Sexual harassment - What is it and what are the current rules and regulations pertaining to it?"

May 12 - Dr. Colin Barnett, Post-Doctoral Research Associate,

National Research Council, NOAA, SWFC, presented a talk on "Methods of the tropical aquarium fishery in Hawaii."

May 21 - Bob Stimson, The Flinders University of South Australia, presented a seminar on "Fishery management through vessel buy-back: Socio-economic implications."

TRAINING

La Jolla Laboratory

May 27-28 - Daisy Gaston-Akinwanile, Budget and Accounting Technician

- Angeles Alvariño, Fishery Biologist
- Douglas DeMaster, Wildlife Biologist
- Barbara Engstrand, Program Support Assistant
- John Henderson, Fishery Biologist
- Rennie Holt, Operations Research Analyst
- Eric Lynn, Biological Technician
- Lorraine Prescott, Editorial Assistant
- Ben Remington, Executive Officer
- Frank Ralston, Computer Specialist
- Bruce Wahlen, Biological Statistician
- Lorraine Zorich, Administrative Assistant;

all attended the "Fifth Annual EEO Workshop," San Diego, California (one-day course).

Tiburon Laboratory

May 12-14 - Marianna Lindland - Clerk-Stenographer - "Better Office Skills and Services," OPM, San Francisco, California.

VISITORS

Honolulu Laboratory

May 1 - Kitty Simonds and Svein Fougner of the Western Pacific Regional Fishery Management Council met with R. Shomura to discuss the Council's programmatic budget.

May 12 - LCDR Dave Foote and YNI(SS) Jim Bertine, U.S. Navy Reserve, San Bruno, California, visited George Liao and Tamio Otsu.

May 15 - Harry Kami, Aquatic and Wildlife Resources Division, Government of Guam, visited the Laboratory.

May 22 - Russ Surbur of the U.S. State Department, who was en route to join the U.S. Embassy staff in Suva, Fiji, met with R. Shomura to discuss South Pacific fisheries matters.

May 26 - Ken Kamimura, President, K. K. Industries, Inc., Saipan, visited R. Shomura and R. Uchida.

La Jolla Laboratory

On May 18, the La Jolla Laboratory was honored by a visit from Mr. Sonatane Tu'a Tuamoepeau Tupou, Secretary for Foreign Affairs of the Kingdom of Tonga. Mr. Tu'a Tupou toured the Laboratory and discussed the affairs of Tongan and U.S. fisheries with Dr. John Hunter, Leader of the Larval Fishes, Coastal East Pacific Program at the Southwest Fisheries Center.

May 1 - CDR Freddie L. Jeffries, NOAA, Seattle, WA.

- Willy Becker, Greenpeace, Madison, WI.

May 7 - Rosalie Craven, AT&T, visited the La Jolla Laboratory to talk with Fred Kellenberger, ADP Systems Manager, regarding telephone system.

May 15 - Floyd Anders, F/SWR, met with Dr. Izadore Barrett, Center Director, at the La Jolla Laboratory.

May 20 - Robert L. Ahlstedt, NOAA AOD, Seattle, WA.

May 21 - Mitchell Roffer, University of Miami, Miami, FL.

May 22 - Mr. Unar Central Research Institute for Fisheries, Aard, Jakarta, Indonesia.

- Mr. Soewito, Directorate General of Fisheries, Jakarta, Indonesia.

- Dr. Sigeiti Hayasi, Nansei Regional Fisheries Research Laboratory, Hiroshima, Japan.

- K. Koski, NMFS, Auke Bay, Alaska.

May 25-29 - Mr. R. Pianet, ORSTOM, Brest, France visited the staff of the Oceanic Fisheries Resources Division at the La Jolla Laboratory.

May 27 - Lew Wright, Western Fishboat Owners Association, met with Dr. Izadore Barrett, Center Director, at the La Jolla Laboratory.

Tiburon Laboratory

May 1 - Rosalie Craven, AT&T, Washington, D.C.

May 3 - Dick Nelson, NWAFC, Seattle, WA.

May 4 - Ronald Hess and John M. Smith, California Department of Fish and Game.

May 5 - Wes Silverthorne, NMFS, Terminal Island, CA.

- Jim Golden, Oregon Department Fish and Wildlife, Newport, OR.

May 6 - Vi Shepard, Oregon Trawl Commission, Astoria, OR.

- Chris Madsen, SAFCOL Holdings Pry Ltd., South Australia.

May 7
- Nick C. Parker, U.S. Fish & Wildlife Service, Marion, AL.
- Jim Merritt, U.C. Davis, Davis, CA.
- Ted A. Smits, Pacific Seafood Processors Assn., Seattle, WA.

May 19
- Ruth T. Pratt, U.S.F.W.S., Sacramento, CA.

May 21
- Shelton P. Applegate, UNAM, Mexico.
- Brooks Townes, National Fisherman, Camden, Maine.

May 26
- Tokihide Ichinose, ABS Fishing Co., San Francisco, CA.
- Masati Ota, Tanaba City, Wakayamaken, Japan.
- Harry Dennis, Friends of the Earth, San Francisco, CA.

MEETINGS AND TRAVEL

Honolulu Laboratory

May 12-20
- Richard Shomura traveled to California to (1) meet with SWFC personnel, (2) participate in the Center Management Meeting, and (3) participate in the Lake Arrowhead Tuna Conference.

May 21
- Richard Shomura attended a budget meeting of the Western Pacific Regional Fishery Management Council at the State Capitol.
- Richard Shomura and Dr. Adams met with Frank Goto at the United Fishing Agency with regard to commercial fisheries data.

May 22
- Richard Shomura conducted a general staff meeting at the Kewalo Research Facility to review (1) the Center Management Meeting, (2) space and room assignments, and (3) research activities.

La Jolla Laboratory

May 3-8 - Dr. Izadore Barrett, Center Director, traveled to Washington, D.C., to attend the RD/CD/OD meeting.

May 3-24 - Dr. Douglas DeMaster traveled to Ensenada, Tijuana, and La Paz, Mexico, to present lectures at CICIMAR and to conduct research on immobilization, marking, and radio tracking of California sea lions.

May 5-6 - Dr. Daniel Huppert attended a Pacific Fishery Council Management and SSC meeting in San Raphael, CA.

May 6 - A general staff meeting on performance standards was held at the La Jolla Laboratory.

May 7-9 - Dr. Reuben Lasker traveled to Corpus Christi, TX to lecture at the University of Texas, Marine Science Institute, Port Aransas, TX.

May 8-9 - Dr. William Perrin traveled to Santa Cruz, CA to serve on a graduate committee for a student's oral qualifying examination.

May 13 - Ben Remington, Executive Officer, met with McCaughey and Smith, architect and engineering contractor, to review the cost proposal for the design and installation of the solar demonstration project at the La Jolla Laboratory.

May 15 - Floyd Anders, F/SWR, met with Dr. Izadore Barrett, Center Director, at the La Jolla Laboratory.

May 17-20 - The following Southwest Fisheries Center personnel from the La Jolla Laboratory traveled to Lake Arrowhead, CA. to attend the 32nd Annual Tuna Conference: Dr. Izadore Barrett (Center Director), John Carr (Deputy Director), Dr. Norm Bartoo, Al Coan, Jr., Dr. Sam Herrick, Hillary Herring-Dyal, Dr. Rennie Holt, Dave Holts, Dr. R. Michael Laurs, Anthony Majors, Robert Nydam, Dr. Ron Rinaldo, Dr. Gary Sakagawa, Dr. Wes Parks, Dr. Tim Smith, Jim Squire, Lillian Vlymen, and Earl Weber.

May 17-23 - Dr. Reuben Lasker traveled to La Paz, Mexico, to present seminars at CICIMAR.

May 19-23 - Dr. Warren Stuntz traveled to Normal, Illinois, to attend the 3rd Biennial Conference on the Ethology and Behavioral Ecology of Fishes.

May 22- - Dr. Daniel Huppert was on sabbatical leave at the

June 16 — University of Washington, Seattle, WA.

May 27 - A CalCOFI meeting was held at the La Jolla Laboratory.

Tiburon Laboratory

May 5-7 - Norman J. Abramson attended meetings of the Pacific Fishery Management Council's Scientific and Statistical Committee in San Rafael, California, as Dr. Barrett's alternate. He also attended meetings of the Pink Shrimp Management Plan Team prior to the Team's presentation of a revised Plan to the Council on May 5. Dr. William H. Lenarz and Edward Ueber also attended.

May 11-16 - Sus Kato travelled to Los Angeles and San Pedro, California, to confer with fishermen, processors, and traders. Most of the discussion centered around development of fisheries for underutilized species.

May 14-15 - Norman J. Abramson attended the Quarterly Management Meeting at the Southwest Fisheries Center, La Jolla.

PERSONNEL ACTIONS

Honolulu Laboratory

May 3 - Jeffrey D. Sampaga, Biological Aid (Microbiology), Conversion to Career Appointment.

May 7 - Nancy C. Green, Biological Science Studies Trainee, Termination of Federal Junior Fellowship Program.

May 11 - Anne M. Houtman, Biological Aid (Wildlife), Stay-in-School Appointment.

- Shoji Teramoto, Fishery Methods and Equipment Specialist, Return to Duty.

May 21 - Martina K. K. Queenth, Biological Laboratory Technician (Fisheries), Conversion to Career Appointment.

May 25 - Jose Enitan, Biological Aid (Microbiology), Separation-Death.

PERSONNEL ACTIONS

La Jolla Laboratory

May 4 - Robert Pitman, Biological Technician - Conversion to Temporary Appointment.

May 9 - Patricia Hadley, Biological Technician - Expiration of Temporary Appointment.

May 11 - Caroline Hastings, Biological Aid - Temporary Appointment.

- Gary Hunt, Biological Aid - Temporary Appointment.

- Amy Kimball, NOAA Junior Fellow Appointment.

- Michael Lichter, Computer Clerk - Temporary Appointment

- Michael Mason, Biological Aid - Temporary Appointment.

- Elise Rothschild, Clerk - Temporary Appointment

May 12 - Karen Blakney, Biological Aid - Temporary Appointment

- Esteban Calon, Biological Aid - Temporary Appointment

- Daniel Fern, Computer Clerk - Temporary Appointment

- Rajan Nicahol, Biological Aid - Temporary Appointment.

- Mark Zdeb, Computer Clerk - Temporary Appointment.

May 16 - Kathy Senini, Computer Assistant - Resignation

May 30 - Richard Evans, Oceanographer - Separation/Transfer

- Frances Tonsich, Secretary/Stenographer - Promotion

Tiburon Laboratory

May 1 - Lisa M. Andrade - Biological Aid - Extension of Appointment

May 3 - Susan M. Pollock - Biological Aid - Extension of Appointment.

May 4 - Daniel F. Howard - Biological Aid - Extension of Appointment.

May 11 - Robert Hamilton - Biological Aid - Temporary Appointment.

- Susan C. Logan - Biological Aid - Temporary Appointment under Stay-in-School Program.

May 31 - Michael G. King - Biological Aid - Extension of Appointment, 1 year.

UNITED STATES
DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
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